A FURTHER ANALYSIS OF THE ECONOMICS OF UNE PRICING[†]

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1. Introduction

In order to set regulated prices for UNEs, current regulations require state commissions to calculate the forward looking economic costs (FLEC) that a hypothetical perfectly efficient firm would incur to produce the UNEs and then set prices equal to these values. As states have interpreted this standard, they are supposed to calculate the costs that would result if the most efficient possible network could be instantaneously and completely rebuilt from the ground up using the least-cost, most-efficient technologies currently available given current input prices and then operated in a perfectly efficient manner, subject only to the constraint that the network design must take as given the existing wire center locations. In the NPRM initiating this proceeding, the Commission has proposed to alter this methodology to require that cost calculations be "more firmly rooted in the real-world attributes of the existing network, rather than the speculative attributes of a purely hypothetical network."[1]

As we explained in a paper submitted earlier in this proceeding,[2] we support this proposal because, among other considerations, it would mitigate TELRIC's current failure to compensate ILECs on a going forward basis either for the costs they actually will incur to produce UNEs, or any reasonable estimate of the efficient level of forward-looking costs of any real-world ILEC. The below-cost UNE rates that result from the current UNE rate setting process reduce the incentives of both ILECs and CLECs to invest efficiently in their networks.

As we explained in our earlier paper, there are two fundamental reasons why the current TELRIC methodology produces cost estimates

1 Notice of Proposed Rulemaking, *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173*, FCC 03-224 (September 15, 2003), ¶ 4.

2 Debra J. Aron and William Rogerson, *The Economics of UNE Pricing*, December 16, 2003. (Hereafter, *Aron and Rogerson*).

that are too low. First, because of its "blank slate"[3] approach, the current standard essentially instructs state commissions to ignore a number of important real constraints that would increase the costs of any real ILEC above those of the hypothetical firm envisioned by TELRIC. Therefore, even if a perfectly objective mechanism were available for implementing the Commission's blank slate approach, the result would be cost estimates lower than any real ILEC could ever hope to attain. The second reason that the current methodology understates cost is that there is, in fact, no objective mechanism available for calculating the costs of a hypothetically efficient firm. The process therefore gives regulators excessive discretion, and, given the significance of sunk costs in this industry, regulators have predictable and well-understood incentives to use this discretion to lower prices below actual costs.

For these reasons, we concluded in our earlier paper that a FLEC methodology of the sort proposed by SBC in this proceeding is analytically far more appropriate than the current version of TELRIC. Namely, we suggested that, for purposes of calculating forward-looking cost, the Commission should instruct regulators to choose a network design that reflects the actual network of the ILEC operated at the efficiency levels at which the ILEC currently operates its network, subject only to the following caveats: (i) anticipated changes within some reasonably short and predictable period may be included in the design if they are documented in the ILEC's engineering plans, and (ii) outmoded assets that are no longer commercially available may be replaced (in a modeling sense) by currently available functionally comparable assets. Such a methodology would take into account the various real-world cost factors that the blank slate approach ignores today and would also significantly reduce the amount of open-ended discretion in the rate-setting process by anchoring the debate more firmly in the characteristics and performance of the *actual* network for which more objective evidence can be gathered.

In this paper we will respond to three issues that have been raised by CLECs and their economic experts in their initial comments. In Section 2, we address AT&T's argument that the sorts of price cap schemes under

[3] We use the term "blank slate" to refer to the fact that the TELRIC calculation allows for a complete redesign of the network from the ground up subject only to the constraint that wire centers be placed in their existing locations.

which most ILECs operate create at best very low-powered incentives for cost efficiency.[4] According to AT&T's logic, this in turn suggests to them that ILECs could be enormously inefficient and that the current TELRIC methodology is therefore both desirable and necessary because it permits regulators to root out all of these potential inefficiencies. The argument is flawed in two respects, as we discuss in the main body of the paper. First, AT&T significantly understates the utility of price caps as a mechanism for promoting efficient behavior and also ignores the powerful independent effects that intermodal competition gives the ILECs to cut waste from their operations. Second, in any event, the main economic rationales we have presented for revising TELRIC as proposed here do not depend on whether or not ILECs are deemed to have met some specified efficiency level. Factors that increase the costs of real ILECs that are not the result of inefficient decisions by those ILECs should obviously be taken into account in the calculation of the cost of even a hypothetically efficient ILEC. More importantly, there is simply no objective way for regulators to calculate what it *should* cost to produce UNEs in a hypothetically perfectly competitive (or "contestable") world, and the predictable effect of pretending otherwise is simply to grant regulators excessive discretion that results in inappropriately low prices.

In Section 3, we address AT&T's contention that, to reflect costs accurately, a FLEC model must overlook the need of any real-world carrier to adapt its existing network over time in response to exogenous changes such as shifts in population. As we explain, AT&T's advocacy on this point is erroneous and nicely illustrates our more general point that TELRIC instructs regulators to ignore costs that no real firm could avoid.

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4 See Comments of AT&T Corp. *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173* (December 16, 2003), pp. 48-50 (hereafter, *AT&T Comments*); Declaration of Robert D. Willig on Behalf of AT&T Corp. *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173* (December 16, 2003), ¶¶ 51-56 (hereafter *Willig Declaration*); and Declaration of Lee L. Selwyn on Behalf of AT&T Corp. *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173* (December 16, 2003), ¶¶ 12-14 (hereafter *Selwyn Declaration*).

In Section 4 we return to the demonstration in our opening paper that actual UNE prices vary widely between states in ways that cannot be explained by any factors likely to affect costs. We begin with some additional analysis that further supports our conclusions. We then turn to studies sponsored by Z-Tel[5] and NASUCA[6] that claim to show the reverse, and we explain why their claims are erroneous. Concluding comments are in Section 5.

In addition to the issues we address here, CLECs have filed comments purporting to support their claim that regulatory policy that promotes unbundling encourages investment.[7] A separate paper prepared by one of us addresses this issue.[8] The paper explains that the Z-Tel empirical analysis, aside from its merits or demerits, is not relevant to this proceeding because it does not and cannot address questions about the effect of UNE *prices* on ILEC or CLEC investment. The various analyses proffered by the Phoenix economists attempt to identify the effects of UNE-P competition, with no control for prices or the relationship of effective UNE prices to their costs. The paper also demonstrates that the AT&T analysis, while it seeks to identify the effects of prices, is not robust to corrections to the timing of the investment data series, and therefore cannot be relied upon to provide evidence regarding the effect of UNE prices on investment. In addition, the AT&T theory does not confront the effects of non-compensatory UNE prices, because it assumes that TELRIC prices are compensatory. Hence, the studies provided by these parties do not address the central issue of this proceeding or

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5 See Robert B. Eklund, Jr. and George S. Ford, *Some Thoughts on FCC's Inquiry into TELRIC*. (Hereafter, *Z Tel Study*).

6 Affidavit of David J. Gabel and Robert Loube, Prepared for the National Association of State Utility Consumer Advocates (NASUCA) *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173* (December 16, 2003), (Hereafter, *NASUCA Study*).

7 Robert D. Willig, William H. Lehr, John P. Bigelow and Stephen B. Levinson, *Stimulating Investment and the Telecommunications Act of 1996*, October 11, 2002; and Comments of Z-Tel Communications, Inc. *In the Matter of Review of the Commission's Rules Regarding The Pricing of Unbundled Network Elements And the Resale of Service by Incumbent Local Exchange Carriers, WC docket No. 03-173,* (December 16, 2003), Attachments 1, 2 and 3.

8 Debra J. Aron, *The Effects of Below-Cost TELRIC-Based UNE Prices on CLEC and ILEC Investment*, January 30, 2004.

undermine the intuitively obvious conclusion that requiring a telephone company to sell services on its network to its competitors at prices that are not compensatory will discourage investment in the long run.

2. ILECs Have Significant Incentives to Reduce Costs and the Economic Rationale For Basing UNE Prices More Closely on ILECs' Actual Networks Does Not Depend on the Magnitude of this Incentive in Any Event

AT&T and its economic experts argue that price caps create inadequate incentives for ILECs to be efficient and that the potential for large inefficiencies therefore justifies the use of a FLEC standard based on a hypothetically efficient firm in order to enable regulators to root out these inefficiencies. We will begin by explaining why the efficiency incentives facing ILECs are likely more substantial than AT&T and its economic experts make them out to be. We will then go on to explain that, in any event, AT&T and its economists have missed the point, because the main economic rationales we have presented for revising TELRIC as proposed here do not depend on whether or not ILECs are deemed to have efficiency incentives precisely as large as those that would exist in a hypothetically perfectly competitive market.

2.1 ILECs Have Significant Incentives to Reduce Costs

As an initial matter, ILECs face significant incentives to be efficient today not just because they have been subject to price caps for many years, but also because they are subject to rapidly growing facilities-based competition from CLECs, cable operators, wireless carriers, VoIP providers, and others.[9] AT&T and its experts have ignored the intense pressures that such competition places on ILECs to cut costs, including the prospect that, if they are less efficient than their rivals, they will be unable to recover their costs and may eventually go out of business. Thus, quite apart from any incentives that price caps may create, the need to prepare

[9] See Opening Comments of SBC Communications *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173* (December 16, 2003), pp. 25-26 and 38-41.

for survival in a new, drastically more competitive marketplace has created powerful incentives for ILECs to seek to be as efficient as possible.

The AT&T economists seek, without evidence, to minimize the importance of price cap regulation for establishing powerful incentives for ILECs to manage their costs. The main argument that AT&T and its economic experts advance is that, in practice, price cap plans tend not to be "pure," insofar as in practice price caps are periodically reviewed, and that regulators may undermine the maximum potential effect of price cap regulation by taking past cost reductions or profits into account when they periodically revise the caps. Neither AT&T nor its economic experts, however, present any evidence at all on the extent to which price caps have actually adjusted in response to cost reductions in the telecommunications industry. Furthermore, while we agree with their observation as to the mechanics of price cap review, we completely disagree with the theoretical conclusion AT&T and its economists appear to draw from this observation: that the incentive effects created by price caps must therefore be trivial. They clearly are not. Suppose, for example, that price caps are revised every five years and the carrier believes that price caps will ultimately recapture half of all cost reductions that it produces. If the carrier were mid-way between price cap reviews and were able to reduce its annual cost by $1 billion, then, as we understand AT&T's argument, the firm would have minimal incentives to implement these changes because it would "only" receive 1 billion dollars per year for two and a half years and thereafter would "only" receive a half billion dollars per year. Obviously those conclusions would not follow. The magnitude of incentives created by price cap plans will depend critically on how long price caps are set for, and the extent to which ILECs believe price caps will actually adjust in response to cost reductions. Our example illustrates that relatively plausible parameter values would still create substantial incentives for ILECs to reduce costs.

Our conclusion that price cap plans do encourage significant efficiency enhancing efforts for ILECs is bolstered by two additional observations. First, there is empirical evidence that price cap plans actually do result in efficiency gains. We discussed some of this empirical literature in our earlier paper.[10] Second, when AT&T was itself subject to price caps, it

[10] *Aron and Rogerson*, pp. 38-43.

offered the Commission a very different view of the efficacy of price caps. In comments submitted to the Commission in connection with a review of its own performance under price caps in 1992, AT&T concluded that, "price caps have provided incentives to greater efficiency and innovation."[11] In fact, AT&T submitted an economic study along with its comments that estimated that "price caps yielded $1.8 billion in cumulative productivity gains over the 1989 to 1991 period. These gains were over and above historical trends."[12]

2.2 The Main Economic Rationale For Basing UNE Prices More Closely on ILECs' Actual Networks Does Not Depend on the Magnitude of ILECs' Efficiency Incentives in Any Event

AT&T's attempt to minimize the importance of price caps by discrediting their efficacy is ultimately beside the point in any event**.** The issue of whether or not ILECs currently have substantial incentives to be efficient is not essential to the central arguments against TELRIC that we have presented in our earlier paper. The first rationale we offered for basing UNE prices more closely on the ILEC's actual network was that the "blank slate" approach of TELRIC essentially instructs state regulators to ignore many real factors that are not the result of inefficient decisions by ILECs but that increase any real ILEC's costs. Factors that render the costs of real ILECs inevitably higher than those calculated according to the current TELRIC standard, but that are not the results of inefficiencies, should obviously be taken into account in the calculation of an ILEC's costs even if we were to calculate the cost of the hypothetically most efficient firm.

The second rationale we offered for basing UNE prices more closely on the ILEC's actual network was that regulatory schemes that deputize regulators to set prices equal to what they believe it should cost to produce particular products simply do not and cannot work. As we explained in

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11 See Comments of AT&T, *In the Matter of Price Cap Performance Review For AT&T, CC Docket No. 92-134*, September 4, 1992, p. 2.

12 See Richard Schmalensee and Jeffrey Rohlfs, *Productivity Gains Resulting From Interstate Price Caps for AT&T*, September 3, 1992, p. 2. (Submitted as an attachment to Comments of AT&T *In the Matter of Price Cap Performance Review For AT&T, CC Docket No. 92-134*, September 4, 1992.)

our earlier paper, the problem is that there simply is no objectively verifiable way for state commissions to determine the hypothetical cost of a hypothetically efficient firm. Therefore, empowering state commissions to determine the value of this hypothetical cost gives them considerable discretion to adjust UNE prices in response to other pressures and concerns that they have. As we explained in our earlier paper, it is a standard and well-accepted conclusion in economics that, when a regulated firm must invest in sunk assets, regulators face powerful short-term incentives to essentially expropriate the firm's sunk assets by setting prices at non-compensatory rates. The reason is that, so long as assets are sunk, firms cannot redeploy them even if they are not being compensated for using them. Therefore, the approach of permitting regulators to lower prices without sufficient objective constraints simply causes the problem we are observing today: regulators set prices below compensatory levels to promote short-run objectives, thereby harming consumers and social welfare generally in the long run.

3. TELRIC Costs Are Too Low Because TELRIC Assumes That Firms Can Adjust Instantaneously and Costlessly to Shifts in the Density and Location of Population

In our earlier paper we argued that TELRIC costs were too low not only because TELRIC gives regulators too much discretion, but also because it ignores costs that any real, efficient firm would have to incur. One important example of this is TELRIC's assumption that the outside plant of the modeled carrier is designed to be perfectly efficient given the current density and location of the customer base. We noted that a real carrier could never achieve costs this low because it must place long-lived assets in the ground that cannot be costlessly and instantaneously altered in response to changes in the location and density of population centers. An example of this phenomenon concerns areas that have grown more densely populated over time. A real-world ILEC that has served such an area for many years, no matter how efficiently it deployed its network initially, forecasted future demand, and upgraded its network in response to these population changes, will still generally have less efficient network facilities and sizing than the theoretically optimal network constructed instantaneously today to serve the area given its current high population density.

When we read the initial comments of AT&T and its economic experts we were somewhat surprised, therefore, to find them describing in great detail precisely the same phenomenon and arguing, just as we did, that TELRIC would produce lower costs than the actual costs of the ILEC in this case.[13] The difference was that AT&T and its economic experts believed this to be a virtue rather than a defect of TELRIC—that the lower TELRIC cost was, in fact, the appropriate or correct cost to use for purposes of calculating UNE prices. Since they posited that the lower cost was in fact the correct cost upon which to set prices, they therefore viewed this as an example that demonstrated why TELRIC was a superior method.

The conclusion of AT&T and its experts that it would be appropriate to set prices at levels so low that no real firm could ever cover all of its efficiently incurred costs strikes us as absurd. Any model of a competitive market must result in firms having the opportunity to cover their costs or they simply will not enter. Yet AT&T and its economic experts are recommending a pricing methodology that necessarily violates this fundamental economic reality. TELRIC calculates prices that would fully compensate a firm only if it could costlessly adjust the design of its network every period to accommodate changes in demand. Since no real firm can actually do so, TELRIC will necessarily under-compensate any real carrier.

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13 "Likewise, the incumbents typically deploy outside plant to serve a particular area, and then incrementally deploy additional outside plant to serve incremental demand (including shifts in population distribution). But the routes that would be used and the cables that would be employed to serve current demand most efficiently will not necessarily be the same routes and cables used in the piecemeal expansion . . . For example, an ILEC may initially install a cable of a certain size and then subsequently add another cable as demand increases. However, the most efficient arrangement would be to deploy a single cable capable of satisfying existing demand because the per-unit costs of a larger cable is lower than the per-unit cost of two smaller cables. Likewise, when an ILEC initially deploys facilities to a particular geographic area, it attempts to minimize the costs of serving that demand given the existing location of customers. However, as the new buildings are constructed the geographical mix of the demand will shift over time. The ILEC will then seek to serve new locations by incrementally expanding its existing network—but in many instances the costs of serving current demand would be lower if the ILEC had the freedom to change the placement of its feeder and distribution cables." *AT&T Comments*, p. 51. Also see *Willig Declaration* ¶ 29.

4. UNE Prices Vary Widely Between States in Ways that Cannot be Explained by Plausible Cost Drivers

In our earlier paper, we concluded that UNE prices vary widely between states in ways that cannot be fully explained by likely cost drivers. We interpreted this as providing evidence that state commissions have considerable discretion to set TELRIC prices at levels that differ idiosyncratically and significantly from costs. In particular, we presented state-by-state data on the value of UNE-P prices, and three variables that were likely to be highly correlated with the "true" level of costs in each state. These were a measure of embedded accounting costs, an estimate of the forward looking UNE-P costs as proxied by the FCC's hybrid proxy cost model (HCPM), and a measure of line density. We conducted two types of analysis of the data. First, since there were only 49 data points, it was straightforward to carefully examine the entire data set and directly check whether or not we could find groups of states with nearly identical cost drivers but with significantly different UNE-P prices. We found many such instances and reported two of them in our first paper.[14] In addition, we also conducted a regression analysis to develop an overall statistical measure of the degree of correlation between UNE-P prices and our cost measures. We reported that even when we included all three cost drivers in the same regression, the adjusted R^2 of the regression was only 42 percent. As we explained in our initial paper, the R^2 coefficient can be interpreted as being a scalar measure of the share of the variation in the UNE-P data that is explained by the cost drivers. Based on both our examination of all of the data and on the fact that a linear regression of UNE-P prices on cost drivers left a substantial fraction of variation unexplained, we concluded that the data provided strong evidence that UNE prices were being set at levels quite different from costs in at least some states.

In this section of our paper we will first provide additional analysis of our results that make apparent the magnitude, in dollar terms, of the unexplained variability in prices. Then we will critique two economic studies submitted in the opening round of comments in this proceeding that claim to show that no such unexplained variability exists and explain why the conclusions of these competing studies are incorrect.

[14] We will report a larger selection of such examples at the end of this section.

4.1 Additional Analysis

While the analysis in our earlier paper clearly demonstrated that UNE prices vary widely between states in ways that cannot be fully explained by likely cost drivers and provided a quantitative estimate of the *share* of the variability of prices that could not be explained by likely cost drivers, it did not directly provide a dollar estimate of the size of UNE price variations that cannot be explained by likely cost drivers and can therefore be ascribed to the exercise of regulatory discretion. In this section we will provide two different approaches to estimating the dollar size of UNE price variations that cannot be explained by likely cost drivers. The first approach is a standard statistical calculation based on the regressions we have already run. The second approach is based on a direct examination of the entire data set. We identify numerous cases where groups of states with the same costs have vastly different UNE prices and report how large these differences are.

Standard statistical calculations allow us to demonstrate, using the results of our regression analysis, the dollar range of UNE-P prices that are associated with any given value of cost drivers given the current variability in the data. In particular, based on the regression results, it is possible to calculate the standard error of the forecast for UNE-P prices.[15] Table 1 presents the standard error of the forecast for each state in our data set based on the regression of UNE-P prices on all three cost drivers (which was the regression that produced the best fit). The first column of Table 1 presents the name of the state. Then the second and third columns present, respectively, the actual UNE-P price charged in that state and the predicted UNE price based on the regression analysis. The fourth column then presents the standard error of the forecast for the UNE-P price for that state. The standard error provides a dollar estimate of the variability in UNE-P prices around the point estimate provided by the regression. Assuming the standard errors are normally distributed, the UNE-P price for a given state will be within a standard error of the predicted UNE-P price approximately 68 percent of the time. Notice that the standard errors are generally in the neighborhood of $4.50. This means that a typical or likely range of variation in UNE prices (that is, about a 70 percent

[15] See Jeffrey M. Woolrdige, *Introductory Econometrics*, Thompson South-Western, 2003, Chapter 6.4 and J. Johnston, *Econometric Methods*, McGraw Hill, 1984, Chapter 2.7.

confidence interval) is equal to the predicted value plus or minus about $4.50, or one cannot predict within $9.00 the UNE-P price in a given state based on cost drivers alone. Given that UNE-P prices themselves are generally in the range of $20, the range of variation that cannot be explained by cost drivers is enormous.

TABLE 1

State	Actual UNE-P Price	Predicted UNE-P Price	Std. Error of the Forecast*	Prediction Error
West Virginia	$44.02	$27.60	4.8449	$16.42
Montana	$34.30	$26.18	4.6665	$8.12
Wyoming	$32.02	$28.15	4.6921	$3.87
South Dakota	$31.71	$25.77	4.7257	$5.94
Nevada	$30.63	$25.12	4.6489	$5.51
Mississippi	$29.79	$30.26	5.0170	-$0.47
Nebraska	$26.76	$26.99	4.6429	-$0.23
North Dakota	$26.55	$26.46	4.7411	$0.09
Idaho	$26.27	$23.92	4.6037	$2.35
Maryland	$26.25	$19.35	4.5878	$6.90
New Hampshire	$25.42	$22.77	4.5855	$2.65
Louisiana	$25.34	$24.24	4.5688	$1.10
Kentucky	$25.08	$27.39	4.6627	-$2.31
Oklahoma	$25.03	$25.30	4.5929	-$0.27
Minnesota	$25.02	$21.74	4.6684	$3.28
Vermont	$24.99	$26.20	4.8093	-$1.21
South Carolina	$24.54	$25.38	4.5998	-$0.84
Georgia	$23.83	$25.57	4.7496	-$1.74
New Mexico	$23.71	$23.49	4.5552	$0.22
Alabama	$23.52	$28.27	4.7849	-$4.75
North Carolina	$22.98	$22.77	4.5687	$0.21
Missouri	$22.72	$24.32	4.5892	-$1.60
Oregon	$22.29	$22.08	4.5877	$0.21
Maine	$22.07	$25.25	4.6818	-$3.18
Colorado	$22.00	$24.33	4.6873	-$2.33
Wisconsin	$21.73	$19.36	5.2518	$2.37
Massachusetts	$21.61	$17.00	4.6646	$4.61
Arizona	$21.25	$20.93	4.6037	$0.32
Texas	$21.22	$23.11	4.6224	-$1.89
Tennessee	$20.88	$24.86	4.5698	-$3.98
Iowa	$20.84	$22.95	4.7165	-$2.11

TABLE 1				
State	**Actual UNE-P Price**	**Predicted UNE-P Price**	**Std. Error of the Forecast***	**Prediction Error**
Washington	$20.77	$20.69	4.5901	$0.08
Florida	$20.59	$18.83	4.6136	$1.76
Utah	$20.52	$21.54	4.6146	-$1.02
Arizona	$19.96	$28.42	4.7477	-$8.46
Rhode Island	$19.69	$18.09	4.6149	$1.60
Virginia	$19.65	$21.62	4.5582	-$1.97
Kansas	$19.60	$24.43	4.6316	-$4.83
Pennsylvania	$19.23	$19.04	4.5992	$0.19
Delaware	$19.06	$20.20	4.5739	-$1.14
New York	$17.17	$20.58	4.6557	-$3.41
Washington, D.C.	$16.83	$9.98	5.4594	$6.85
Michigan	$14.50	$18.97	4.7235	-$4.47
California	$14.48	$17.21	4.6477	-$2.73
New Jersey	$13.75	$16.08	4.7030	-$2.33
Ohio	$13.42	$19.12	4.5938	-$5.70
Illinois	$12.22	$16.73	4.6706	-$4.51
Indiana	$12.15	$19.31	4.6861	-$7.16

*The standard error of the forecast is given by the formula $\sigma^2 + \sigma^2 X_0'(X'X)^{-1} X_0$, where X_0 is a vector of regressor observations corresponding to the value of the dependent variable that is to be forecast, X is the matrix of the set of observations for the different regressors, and X' is the transposed matrix of X.

The fifth column of Table 1 presents the residuals of the regression for each state, i.e., the difference between the actual UNE-P price and the predicted price based on the regression. The size of and range of the residuals similarly demonstrate the considerable noise—in dollar terms—in the relationship between prices and costs. It is necessary to expand an interval around zero plus or minus about $4.00 in order to include about 70 percent of the residuals.

Since there are only 49 data points in the sample, it is possible to supplement statistical measures by directly examining all of the data to directly observe the extent to which states with similar cost estimates tend to have different UNE prices. In Table 2 we identify 6 groups of states.

All of the states within each group have almost identical costs according to the HCPM estimates,[16] but the variation of UNE prices within each group is huge. The cost variation between the highest and lowest cost state within each group is less than $1. The fourth column of Table 2 presents the dollar variation between the highest and lowest UNE-P price within each group. As can be seen from the table, the dollar difference between the highest and lowest UNE-P price within each group was generally between $9 and $13. In group 5, the highest UNE-P price was a full $30.60 higher than the lowest UNE price. Even ignoring this group, the average difference between the highest and lowest UNE price across the other five groups was $10.95. Thus direct examination of the data yields a dollar estimate of the variation in UNE-P prices that cannot be explained by likely cost drivers quite similar to the statistical calculation we reported above.

[16] We use the HCPM estimate of forward looking cost as our cost estimate because this seems most similar to the Hatfield model estimate used by the Ekelund and Ford study which will be critique below. Very similar results can also be produced using the booked cost estimates.

TABLE 2
GROUPS OF STATES WITH VIRTUALLY IDENTICAL UNE-P COST ESTIMATES BUT WIDELY VARYING UNE-P PRICES

		HCPM Cost	Price	Price Variation Within Group*
Group #1:				
	WY	33.01	32.02	
	ME	32.18	22.07	9.95
Group #2:				
	KY	31.35	25.08	
	MT	31.24	34.30	
	AL	31.21	23.52	10.78
Group #3:				
	LA	27.41	25.34	
	TN	27.23	20.88	
	AR	27.20	19.96	
	SC	27.12	24.54	
	SD	26.55	31.71	11.75
Group #4:				
	CO	22.35	22.00	
	IN	22.33	12.15	
	MN	22.28	25.02	
	DE	21.80	19.06	
	MI	21.78	14.50	
	PA	21.68	19.23	
	OR	21.64	22.29	12.87
Group #5:				
	WV	21.20	44.02	
	FL	20.97	20.59	
	TX	20.81	21.22	
	MD	20.66	26.25	
	OH	20.55	13.42	
	RI	20.50	19.69	30.60
Group #6:				
	CA	19.07	14.48	
	NJ	18.98	13.75	
	MA	18.90	21.61	
	IL	18.68	12.22	9.39

* Dollar Variation = (Highest UNE Price In Group) - (Lowest UNE Price In Group)

4.2 Critique of Other Studies

In the opening round of comments in this proceeding, Z-Tel submitted a similar sort of study to ours conducted by economists Robert Ekelund and George Ford[17] that came to the opposite conclusion. Ekelund and Ford regressed UNE-L prices for various states on the Hatfield model cost estimates for loop prices and, based on the results of the regression analysis, drew the conclusion that "the Commission's concern that variation in UNE prices (both across states and over-time within states) is driven by factors other than 'genuine cost differences' or the state regulator's inability to implement TELRIC is unsupported by the data."[18]

While there are some differences between our study and theirs regarding the data that was used and the functional form of the regressions that were run, these differences seem to be relatively minor. Both studies regressed UNE prices on cost estimates and found that, while cost estimates certainly explained some of the variation in UNE prices, the regression still left a substantial amount of variation in UNE prices unexplained. The main reason that Ekelund and Ford appear to arrive at diametrically opposed conclusions to ours is not because they are analyzing fundamentally different data or using different statistical techniques, but rather that they have chosen to interpret fairly similar results to those we found as implying almost exactly the opposite conclusion. We will explain that Ekelund's and Ford's conclusion that UNE prices are well explained by cost estimates depends on a fundamental error in the interpretation of their results.

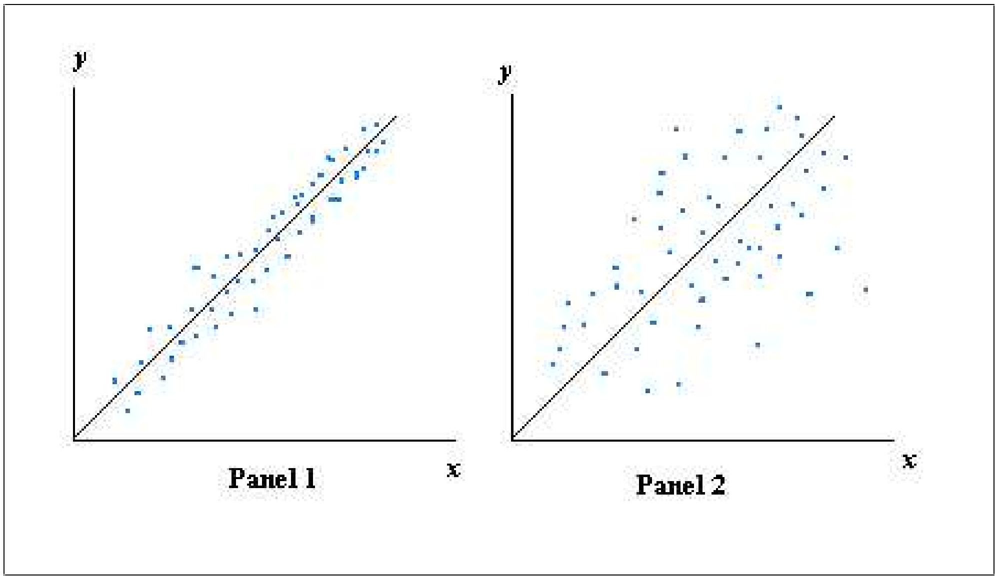
The fundamental error that Ekelund and Ford make in interpreting their results concerns their interpretation of the regression parameter on the cost estimate term in the regression they calculate. In particular, the Ekelund and Ford regression analysis shows that a one-dollar increase in estimated cost tends to increase the *average* UNE-L price in the data by close to one dollar.[19] They incorrectly interpret this as demonstrating that the observed variation in UNE-L prices is well explained by costs. It may well be true that there could be a statistically significant marginal effect of costs on prices on average over the entire sample and yet there still could be a significant deviation across the observations that is not explained by the cost variable. For example, consider the two panels below. In both

17 See *Z-Tel Study*.

18 See *Z-Tel Study*, p. 10.

19 While they run their regressions in log format, they argue that their cost coefficient is statistically indistinguishable from one, and their estimated constant is statistically indistinguishable from zero, implying a linear relationship with slope one.

cases, a regression of ***Y*** on ***X*** would likely produce a statistically significant coefficient on the x variable, and indeed the coefficient would be equal in the two examples as drawn. On the left, however, the variable ***x*** explains virtually all of the variability in ***y***. In the example on the right, the variable ***x*** explains very little of the variation in ***y***. Since our inquiry pertains to the extent to which costs explain prices, the significance of the coefficient is of minimal importance.



As another example, suppose we have a data set for four states and that two of the states have cost estimates of $20 while two of the states have cost estimates of $30. Now consider two different patterns for UNE prices. In the first pattern suppose that both states with cost of estimates of $20 have UNE prices of $20 and that both states with cost estimates of $30 have UNE prices of $30. In the second pattern, suppose that one of the two states with low cost estimates has a UNE price of $10 while the other has a UNE price of $30. Similarly, suppose that one of the two states with a high cost estimate has a UNE price of $20 while the other has a UNE price of $40. In both patterns the average UNE price moves in a strictly one-to-one fashion with the cost estimate. That is, in both patterns of the data a regression analysis would correctly show that when the cost estimate increases by $10, so does the average UNE price. However, in the first pattern of data, costs explain 100 percent of the variation in UNE prices while in the second pattern of data they leave a very substantial fraction of the variation unexplained. Therefore Ekelund's and Ford's statistical finding that the average UNE price tends to move in proportion to the cost estimate is completely irrelevant to determining what fraction of the variation in UNE prices can be explained by cost estimates and their contrary assertion is incorrect.

When UNE prices are regressed on an estimate of costs, the correct estimate of the extent to which the variance in UNE prices can be explained by variation in costs is, of course, the R^2 of the regression. While their primary attention is erroneously focused on the value of the regression coefficient on estimated cost, Ekelund and Ford do also report the R^2 of their regression. While we obtained an R^2 of .42 in our regression, Ekelund and Ford report that they are able to achieve an R^2 of .69 by using a log/log specification on their data. While this is somewhat higher than the R^2 we obtained, it is still the case that a substantial fraction of the observed variation in UNE prices cannot be explained by variations in costs.

The National Association of State Utility Consumer Advocates (NASUCA) submitted another study by economists David Gabel and Robert Loube[20] that also claims to demonstrate that the variation in UNE prices is largely explained by variation in cost drivers. They find, using a Spearman rank correlation test, that the correlation in the rankings is statistically significant. They conclude from these results that "states have been able to see through the box and have been able to maintain reasonable and predictable rates."[21] This study is flawed because it uses a statistical technique that is incapable of addressing the question at issue. Instead of directly assessing the correlation between the levels of UNE prices and costs, this study simply attempts to determine if the ordinal rankings of UNE prices and cost estimates are correlated. It is obvious, however, that ordinal rankings could be perfectly correlated even if the levels of the variables had a weak relationship. For example, suppose that there are four states with cost estimates of $20, $21, $30, and $31, and that

[20] See *NASUCA Study*.

[21] *NASUCA Study*, ¶ 92.

the UNE prices for these states are, respectively $10, $25, $26, and $40. The correlation of ordinal values is perfect (Gabel and Loube would find a Spearman rank correlation of one with this series, interpreting that to mean that prices are well-explained by costs), though there is obviously an enormous amount of variation in prices that is not explained by variation in costs. Hence, the Gabel and Loube tests are incapable of capturing the very sorts of variations that we are seeking to assess. We conclude that Gabel and Loube's test provides no useful basis for concluding that state commissions have been able to determine reasonable or predictable prices at all, let alone that they are well explained by costs.

5. Conclusion

The current TELRIC methodology used to determine UNE prices results in prices that do not provide ILECs with an opportunity to recover the forward-looking costs of providing UNEs. This dampens ILEC incentives for investment, and the problem will grow worse as CLECs respond to below-cost prices for UNEs by purchasing an ever-growing share of ILECs' services. In addition, mandating below-cost UNE prices essentially amounts to offering CLECs a subsidy only if they agree to enter without investing in their own facilities. The policy therefore inefficiently distorts the mode of CLEC entry away from facilities-based entry and towards UNE-based entry. The two main reasons that the current TELRIC approach results in prices that are too low is that (i) its blank-slate methodology causes it to ignore real factors that increase ILECs' costs that are not inefficiencies and (ii) its focus on the hypothetically most efficient network instead of the ILEC's actual network places insufficient objective constraints on regulators to set prices at compensatory levels. These problems could be best solved by adopting a methodology that attempts to calculate the forward-looking cost of building the network the ILEC has actually built, as it will evolve over a reasonable planning period, using the levels of efficiency it has actually achieved.